IBM Infoprint 1312
Secure MICR Printer
User's Guide

Source Technologies
2910 Whitehall Park Drive
Charlotte, NC 28273
www.sourcetech.com
techsupport@sourcetech.com
800-922-8501

© 2003, Source Technologies
All rights reserved.

Written and produced by Source Technologies
July 2003

This manual serves as a reference for Source Technologies Secure MICR Printer. This manual should be used as a reference for learning more about MICR technology, and developing MICR printing applications. This guide was produced to assist IS Technicians and Engineers in the integration of Source Technologies' programmed printers with their custom MICR applications. The guide also contains information on MICR related error messages that post to the operator panel.

Every effort has been made to ensure that all the information contained in this booklet is complete and accurate. Changes, typos, and technical inaccuracies will be corrected in subsequent publications. This publication is subject to change without notice. The information and descriptions contained in this manual cannot be copied, disseminated, or distributed without the express written consent of Source Technologies, Inc. No liability, expressed or implied, will be assumed by Source Technologies, Inc. or its dealers or affiliates for any damage resulting from use of this information. Additional copies of this publication can be received through the Marketing Department of Source Technologies.

All trade names or products used in this manual are for identification purposes only and may be trademarks or registered trademarks of their respective companies.

© 2003, Source Technologies
All rights reserved

Table of Contents

1. Printer Installation 1

2. MICR Overview 2
- The Check Processing System 2
- MICR Printing Today 2

3. MICR Check Design 4
- General Features of Check Design 4
- Position and Dimension Gauge 4
- Design Elements in Detail 4
- Data Elements 5
- Figure 3.1 Sample Check 9

4. Quality Issues 10
- Printer Features 10
- MICR Toner 10
- MICR Check Stock 11

5. Security Issues 12
- Check Stock Security Features 12
- Security Note 13

6. MICR Features 15
- Secure MICR 15
- MICR Fonts 15
- Secure Fonts 15
- MicroPrint 16
- Resource Storage 16
- MICR Toner Cartridge 16

7. MICR Commands 17
- Fonts and Secured Resources 17
- PJL Unlock Sequence 17
- PJL Re-Lock Sequence 17
- PJL Re-Lock Sequence with New Password Value 18
- PCL Font Call Commands 18
- PJL Info MICR Command 19
- Error Messages 21

© 2003, Source Technologies
All rights reserved

8. MICR Commands Examples 22
PJL Unlock Sequence 22
PCL Initial Setup 22
PCL Macro Call 22
PCL Font Calls, Position Commands, & Variable 23
PJL Re-lock Sequence 23
Figure 8.1 Sample Accounts Payable Check 24
PJL & PCL Commands 25

Appendix

Appendix A: E-13B MICR Font Mapping 1
Appendix B: Secure Numeric Font Mapping 2
Appendix C: ICR Secure Numeric Font Mapping 4
Appendix D: CMC7 MICR Font Mapping 5

© 2003, Source Technologies
All rights reserved

1. Printer Installation

For complete information on how to unpack and setup your printer, see your printer's user's guide. Please read the following if you are going to install the printer driver shipped with your printer.

1. Locate the CD that was shipped with your printer.

Note: If you do not have a CD-ROM drive on the host PC, locate another computer with a CD-ROM drive, start the CD-ROM utility, and then follow the instructions on the screen to create printer driver diskettes.

2. Follow the instructions in the CD booklet to start the printer setup utility appropriate for your operating system, i.e. Windows 95, NT, etc. The setup utility will install printer driver and utilities to manage Source Technologies printer(s) attached to your PC or Network.

3. The Source Technologies printer, in most cases, assumes the printer driver is set to the internal DEFAULT values. The following Default values should not be changed for best overall printer performance and data stream requirements of the ST Secure MICR printer.

   - Print Resolution under the Graphic Tab should be set to the Default value of 600 DPI.
   - Print Quality and PictureGrade under the Graphic Tab should be set to the Default values of Use Printer Default.

A majority of other driver options can be set for your particular requirements. The most obvious of these would be a Paper Tray selection if your application uses the Print Driver Setting.

© 2003, Source Technologies
All rights reserved

2. MICR Overview

MICR stands for Magnetic Ink Character Recognition. All MICR documents have a MICR line with numbers and symbols printed in a MICR font with magnetically chargeable toner. Each character of the MICR font has a unique waveform when sensed magnetically. Financial institutions and the Federal Reserve use the MICR line to identify and sort checks. The high-speed automated processing of checks and other financial documents depends on the accuracy and the integrity of the data printed in the MICR line. Your new Source Technologies Secure MICR Printer is specifically designed to produce high quality MICR documents.

The Check Processing System

As a MICR document travels through the check clearing system it is processed an average of almost seven times by high speed reader/sorter machines. Some checks are read up to 30 times or more by these machines. Reader/sorter machines charge the toner in the MICR line and then read the line with a magnetically sensitive reader.

The MICR line contains numbers and symbols to indicate the check serial number, the routing number of the drawee institution and the makers' account number. The institution of first deposit encodes the check amount in the MICR line to be read by the reader/sorter equipment. Checks travel through reader/sorters at up to 20 miles-per-hour (2,400 documents per minute) with each MICR line read in three hundredths of a second.

MICR Printing Today

Congress established the Federal Reserve System (FRS) in 1913. Today most commercial banks in the United States belong to the FRS. Many other depository institutions provide banking and checking account services to the public. These other institutions, such as some credit unions, savings and loan associations and non-member banks, are not formally part of the FRS. However, they have access to the payment services it provides and are subject to many of the FRS regulations.

In 1958, because of the explosive growth of check usage, the American Bankers Association selected the E-13B MICR font and the MICR system as the technology for high-speed check processing. Today, check standards are determined by the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) X9B of which Source Technologies is a voting member. The latest versions of the standards and technical guidelines are available from;

Hardcopy:
Global Engineering Documents
Phone 800-854-7179 or 303-397-7956
Fax 303-397-2740
global@ihs.com
http://global.ihs.com

Softcopy:
X9 Electronic Bookstore
www.X9.org - click ESS
www.ansi.org - click ESS
or
http://webstore.ansi.org

© 2003, Source Technologies
All rights reserved

The key standards that address check documents are as follows:

ANSI X9.7 Specifications for Bank Check Background and Convenience Amount Field
ANSI X9.13 Specifications for Placement and Location of MICR Printing
ANSI X9.18 Paper Specifications for Checks
ANSI X9.27 Print and Test Specifications for Magnetic Ink Character Recognition (MICR)

© 2003, Source Technologies
All rights reserved

3. MICR Check Design

General Features of Check Design

To be a legal and negotiable document, the necessary elements required on a check are the date, amount, payee, drawee institution, and payer's signature.

Other elements included in a good check design are: the amount in words, account title, check serial number, fractional routing number and MICR line.

A good check design contains security features and is formatted to be easily read by both machines and the human eye. If the format is complicated, the depositor, bank employee or reader/sorter machine may make an error in reading the data.

Position and Dimension Gauge

A MICR position and dimension gauge (Source Technologies' part number 205-1000MGE or 220-M1027-34) is an important tool for use in designing checks. During check design, check your output against this gauge to determine if the data elements are correctly positioned on your document.

Design Elements in Detail

Paper

The ideal paper for check production is 24 lb. laser bond. Our MICR lab has tested paper stock from most major manufacturers and has compiled a list of products that produce superior results. Contact your sales representative for this information. For a fee, Source Technologies will test your paper for proper MICR adherence and check reader/sorter performance. There are also many security features available to aid in the overall security of your MICR documents. See Chapter 5: Security Issues for more information on check stock specifications and security features.

Size

The size of check documents must be:

Between 6.00 inches and 8.75 inches in length
Between 2.75 inches and 3.66 inches in height

We recommend standard 8.5" X 11" letter size stock or 8.5" X 14" legal size stock for proper feeding through your ST Secure MICR Printer. The number of checks per page is determined by your application. Custom size stock other than letter or legal can be done with proper planning and application programming within the paper size specifications for the base printer.

© 2003, Source Technologies
All rights reserved

Design Elements in Detail (cont)

MICR Clear Band

The MICR clear band is an area at the bottom of the check where the MICR line prints. No other magnetic printing should appear in this area on both the front and back of the document. The clear band is an area 0.625 (5/8) inches high from the bottom of the check running the entire length of the check. Exact MICR line placement in this area is very important. See Figure 3.1: page 9 for more information on MICR line placement.

Data Elements

Date

The date is a required data element for a check. It represents the day on or after the transfer of the check amount may take place. It is usually placed in the upper right portion of the check so it does not interfere with the convenience amount field. The common format is Month, Day and Year, however, the military format of Day, Month and Year is also acceptable.

Amount

The amount of the check is a required element for negotiation. The amount usually appears at least twice on the check. The amount printed in numbers is called the convenience amount. The amount printed in words is sometimes referred to as the legal amount, this is the amount that applies if there is a difference between the two amount fields. The amount may also be printed a third time on the check in a secure font, intended to make alteration of the amount field difficult. See Chapter 6 and Appendix B for information on Source Technologies' Secure Numeric Font.

Convenience Amount

The convenience amount location is specified in ANSI X9.7. The basic location is illustrated in Figure 3.1. Since this amount can be machine scanned, its location and design should be kept within the specifications. The amount beginning with the dollar sign should be left justified within the scan area with numbers spaced normally to the right. The dollars and cents should be separated by a decimal point with the cents printed in the same size font as the rest of the field. Embedded commas should not be used. The convenience amount background should have good reflectance so it does not interfere with optical scanning (see ANSI X9.7).

The convenience amount should be printed in a simple, fixed pitch font. We recommend our ICR Secure Numeric Font (see Appendix C). It was designed to be easily read by image capture equipment and is also a fraud deterrent. A fixed pitch courier font, or if available, OCR-B, are also acceptable fonts to print the convenience amount.

Note: The Source Technologies' Secure Numeric Font (see Appendix B) should not be used in the convenience amount since it is not a machine readable font.

© 2003, Source Technologies
All rights reserved

Data Elements (cont)

Amount In Words

The amount in words (sometimes called the legal amount) is normally located either above or below and to the left of the convenience amount. The area for the amount in words should be entirely filled to make alterations difficult. The amount should start at the far left of the line with the words placed immediately adjacent to each other. The cents need not be written out. They may be expressed as a fraction (60/100), and should be placed immediately to the right of the dollar amount and followed by a line or other space filler to inhibit alteration.

Example: One hundred forty-four and 62/100----------DOLLARS

Given the available area on the document, you may need to use a smaller font when printing larger value amounts.

Payee Area

The payee is a necessary element for a negotiable document. The payee area is generally to the left side of the document either above or below the amount in words. It is often preceded by the words “Pay to the Order Of.” The payee data should not enter the MICR clear band which extends 5/8 of an inch above the bottom of the check.

Signature Area

A signature is a required element for a negotiable document. The signature or signatures authorize the bank to honor the check; therefore, it must match the bank’s records. The signature area should be beneath the convenience amount area but the signatures should not enter the convenience amount area nor the MICR clear band. This is especially true if you print the signature with MICR toner.

We recommend using our MicroPrint font for the signature line as a fraud deterrent. Information on how to utilize this font is in Section 6: MICR Features.

Drawee Institution Name

The name of the institution where the maker’s account is located is referred to as the drawee institution. The bank’s name, city, and state are required.

Account Title

The account title is normally printed in the upper left corner of the check. It includes the name of the account holder and other information such as addresses, telephone numbers, and logos. The data in the title should be legible and sufficiently complete so that if the MICR data account number is destroyed, the drawee institution can refer to the account title in order to trace the account number.

© 2003, Source Technologies
All rights reserved

Data Elements (cont)

Memo Line

This line is located in the lower left quadrant of the check, and is not required. Data printed here does not contain any legal significance. Printing in this area with magnetic toner should not extend downward into the MICR clear band which is 5/8^{ths} of an inch above the bottom of the check.

Check Serial Number

The check serial number is generally printed in the upper right quadrant of the check. Although the check number is not required for the check to be negotiable, the account holder and financial institution use these numbers to reconcile statements and stop payments. The check serial number should also appear a second time in the MICR line, and these numbers should match. The number of digits in the check serial number is controlled by the financial institution and the MICR line format. Consult your banking institution for their requirements.

Fractional Routing Number

The fractional routing number should be printed in a fractional format in the upper right quadrant of the check. This number is assigned to identify the Federal Reserve District and drawee institution. Consult with your bank for the proper routing number and format for each of your accounts.

MICR Line

Accurate high-speed processing of your checks by financial institutions is enabled by the accuracy and integrity of the data in the MICR line. Refer to figure 3.1 for the location of the following MICR line fields. The MICR line is read from right to left with position one being the right most position proceeding to position sixty-five on the left. The MICR line must be printed at exactly eight characters per inch.

Auxiliary On-Us Field Positions 65 to 45

This field usually contains the check serial number for commercial size checks and possibly account control information. It is bounded by On-Us symbols. (⑈). It is not included on personal, small size checks.

External Processing Code (EPC) Field Position 44

This one digit field is position 44 of the MICR line. This field is usually left blank. The use of this field is reserved by the ABA and is controlled by the ASC X9B Standards Committee.

Routing Field Positions 43 to 33

The routing field is bounded by Transit Symbols (⑆) in positions 43 and 33. It contains fixed format information about the drawee institution. Consult with your bank for the specific data field to be placed here for each of your accounts.

© 2003, Source Technologies
All rights reserved

Data Elements (cont)

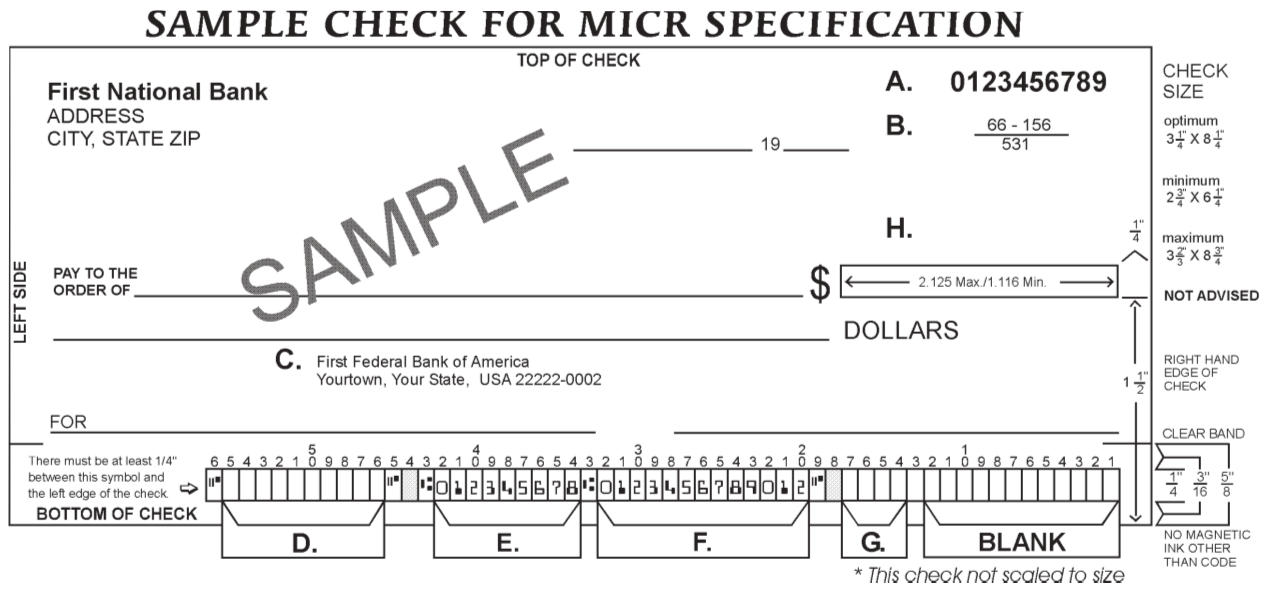
On-Us Field Positions 32 to 14
The On-Us field contains the makers' account number. The structure and content of this field is left to the drawee bank. On personal checks this field also contains the check serial numbers. The On-Us field may not consist of more than 19 characters. An On-Us (⑈) symbol must appear immediately to the right of the account number.

Blank Field Position 13
Position 13 is always left blank.

Amount Field Positions 1 to 12
The amount field is the right most field in the MICR line. It remains blank until it is printed by the bank of first deposit. When the check enters the banking system, the bank of first deposit encodes this field from data in the convenience amount field. It will be bounded by Amount Symbols (⑆).

© 2003, Source Technologies
All rights reserved

Figure 3.1: Sample Check



A. Serial Number: Must be in the upper right corner and match the serial number in the MICR line (see D for further explanation).

B. Fractional Routing Transit Number: Should be in the upper right corner and must match the routing transit number in the MICR line with the exception of the state prefix number (ex. 66 = NC, 67 = SC, 64 = GA, etc.) and the preceding zeros.

C. Bank Name, State, City: The bank logo is optional. Name of bank, city and state where the account will be assigned/opened is a required field.

D. Aux On Us (46-55): This is a required field if the customer desires services offered by the bank which require a serial number. The serial number format is controlled by the payor's bank. A & D should match.

E. Routing Number (34-42): Designates the Federal Reserve district and financial institution. Each city, state or region that the bank serves has a unique institution identifier. IMPORTANT: positions 35-42 is the Routing Number, position 34 is the check digit.

F. Account Number: This is a unique number assigned to the customer's account.

G. Optional Serial Number: Used for personal accounts (checks only). A 4 digit zero filled field that should match the serial number in the upper right corner.

H. Convenience Amount Area should be in the general location shown above in the diagram. The illustrated box in the diagram is optional and if used, should conform to ANS X9.7. A single stroke dollar sign is required.

© 2003, Source Technologies
All rights reserved

4. Quality Issues

A high quality MICR document can be read by bank reader/sorter equipment many times with no readability issues and does not result in damage to bank equipment. This quality is the result of a well designed printer, an originally manufactured MICR toner cartridge and high quality check stock.

Printer Features

Your Secure MICR Printer is equipped with some features to ensure high quality MICR documents.

Paper Type

We recommend paper trays with check stock be set to “bond” paper type. The associated “weight” and “texture” settings should be set to “heavy” and “rough.” See the base printers User’s Guide. If more than one input tray has check stock and they are the same stock, set all to “bond” and they will be linked. If different stock is used in more than one input tray, use “custom” type, “rough” and “heavy” to block linking.

MICR Toner Low

When MICR toner is low, the printer stops and the user is prompted to load a new MICR toner cartridge. We recommend shaking the cartridge to prolong its life. Once low toner is sensed, there is enough tomer to print an additional 200 to 250 quality MICR documents, assuming an approximate 5% average page coverage.

MICR Toner Empty

When the cartridge is determined to be too low to continue, the printer stops. A new cartridge needs to be installed to continue printing.

MICR Toner

Use only Source Technologies MICR toner when printing MICR documents. It is specifically engineered to print quality MICR documents with your printer. The printers’ MICR toner sensor is designed to work with the Source Technologies MICR toner cartridge to prevent printing checks with regular toner present. You may choose to use this printer for general office printing, which is acceptable. If a regular toner cartridge is installed, the printer will stop and prompt the operator to install a MICR toner cartridge.

Source Technologies does not recommend the use of refilled MICR toner cartridges. Although refilled cartridges are generally less expensive, they may result in expensive printer repairs and bank check reject fees due to inferior MICR toner formulation.

© 2003, Source Technologies
All rights reserved

MICR Check Stock

Check stock has a large impact on the resulting quality and security of your MICR document. Here are a few features that should be considered when selecting a check stock. Please see Chapter 5: Security Issues for more information on check stock security features.

Quality
Quality MICR check printing with your ST Secure MICR Printer requires check stock that matches the printer's requirements. Source Technologies can supply paper specifically made for our printers. If you wish to order check stock from other suppliers, please show the following requirements to your sales representative. We will test other suppliers' paper for a nominal fee.

Layout
Layout your check design before any paper is purchased or layout your design to existing check stock. Keep in mind, perforations, orientation, special logos and any color elements. The printer can print just about anything as long as it is black.

Weight
We recommend 24 lb. - 29 lb. paper.

Stiffness
We recommend taber M.D. 2.5 and C.D. 1.1 minimum.

Smoothness
For best toner fusing, we recommend rougher surfaces within the base printers' specifications, and the Paper Specifications for Checks, X9.18.
We recommend a smoothness range of 150 to 200, Sheffield.

Paper Grain Direction
When using 24 lb. - 29 lb. bond paper we generally support either long or short paper grain. Overall performance in the banks reader/sorters is best when the resultant grain direction is left to right when viewing the check.

Perforations
All perforations in the stock should be Micro-Perfs (20 or more cuts per inch). Larger perforations can produce excessive paper chaff and result in damage to the toner cartridge. Perforations should be ironed by the paper supplier to reduce nesting and potential double feeding.

Moisture
The paper moisture content should be between 4.7 and 5.5%. Storage conditions have much to do with the final moisture content of most papers. Store your check stock in a cool, dry, environmentally stable and secure area. Protective wrappings should be removed just prior to use.

© 2003, Source Technologies
All rights reserved

5. Security Issues

Printing negotiable documents from blank paper on desktop MICR laser printers makes security a top priority for any company embarking on a desktop check printing project.

Good security programs integrate hardware, software, your employees and your financial institution into a secure check production system. Recent changes relative to the responsibilities of banks and their customers have a bearing on the ultimate liability for fraudulent documents. Customers must have systems designed and documented to show "Ordinary Care and Good Faith Effort" is in place to avoid liability. In the past, financial institutions generally credited corporations when fraud was discovered. New regulations attempt to define who may have been negligent in the transaction and put the liability on that party or parties. Clearly, if a fraudulent occurrence can be traced to a corporation's lack of security procedures, or the design of their negotiable documents, the regulations will protect the banks, or at best case the loss will be shared.

Check Stock Security Features

We have found the following check stock security features to be of merit:

Artificial Watermarks - White on white printing generally on the back reveals words or patterns when held at an angle. You should state on the front of the check that this feature is present. True watermarks are valuable but more costly.

Laid Lines - Background lines that make cut and paste alteration difficult. These are normally on the back of the check.

Fuse Enhancing Additive - Coatings or additives to the paper that improve the bonding of toner to the paper. This helps prevent altering of critical data such as the amount, or payee name.

Chemical Additives - If an ink eradicator (bleach, acetone, etc.) is applied to the document, the eradicator creates a permanent stain.

Numbered Check Stock - Sequential numbering printed in dye that penetrates to the reverse side of the check can be used to verify authenticity. This also provides for inventory control of blank check stock. This number should not be linked or be equal to the check serial number due to the potential of double feeding in laser printers.

NOTE: These features serve as a general guide for check security. You should not consider these features as an all inclusive list. We recommend consulting with your paper supplier for any additional comments or suggestions.

© 2003, Source Technologies
All rights reserved

Security Note

Check fraud in the United States is a continuing problem. We have attempted to identify security features that can be incorporated into the base check stock. However, these may not prove 100% fraud preventative. Over time, technology will continue to develop new and improved measures to address check fraud.

The following internal and external security measures will help minimize your risk of check fraud.

1. Financial institutions should train tellers to look at the check, not the person presenting the check. The check, not the person, is the item that must be verified.

2. Firms accepting checks should be aware of damaged MICR lines. Intentionally damaging the MICR line can increase the time necessary to process an item, giving the forger enough time to leave town. Also be sensitive to discoloration, this could be an indication of alteration.

3. Incorporate security features into your base check stock and utilize printed security features that address both alteration and counterfeiting of original items. A short list of these features would be:
    - Warning Bands, or other methods that alert recipients to visual security features;
    - Artificial or genuine watermarks in the base paper;
    - Chemical additives in the base paper that react to chemical alteration attempts;
    - Void Pantographs that address attempts to copy original items;
    - Unique security fonts that deter attempts to alter payee or amount information.

4. When generating final negotiable items,
    - The document always includes the amount value in words;
    - The document should not include information that limits the value range, i.e. “Not valid over $500.” This only guides the fraudulent attempt. Use your application software to detect out of range items;
    - All levels of hardware and software password protection should be utilized.

5. Safeguard check stock paper, and limit access only to necessary employees.

6. Understand and approve the security procedures of your check stock suppliers to safeguard stock in their custody.

7. Use “Positive Pay” check services from your financial institution that match check number and dollar amounts to known information. Financial institutions should encourage full participation of corporate clients.

8. Move methods of fraud detection to the item’s point of entry into the clearing system. For example, low cost readers can detect low magnetic strength in the MICR line which is a good indication of attempts to copy an original.

© 2003, Source Technologies
All rights reserved

9. Always verify the home address and place of employment of new account applicants. Use public sources such as phone books to verify phone numbers. Ask new account applicants why they are opening an account with your institution. Be suspect of unusual answers or delays in responding.

10. Stay abreast of current check fraud methods and the latest in fraud detection. Offer seminars to educate corporate clients.

11. Review and document your internal negotiable document printing procedures. Investigate employee backgrounds before assigning security authority. Split responsibilities, for example, an accounts payable production/security officer should not also balance the account.

© 2003, Source Technologies
All rights reserved

6. MICR Features

Source Technologies' Secure MICR Printer is designed to allow both general office document printing and secure MICR document printing. You may print a variety of conventional jobs with MICR toner using all of the printer features available. These printers come standard with PCL5e, PCL6, and PostScript Level 2 emulation. Source Technologies has designed features to enhance the base printer for MICR specific printing that allows you to securely print high quality negotiable documents.

Secure MICR

Your ST Secure MICR Printer has resident fonts for printing MICR documents password secured in printer Flash memory. Accessing these resources requires specific PJL commands to unlock and relock these font resources. While unlocked they can be assessed with standard PCL5e commands. This is discussed in more detail in Section 7: MICR Commands. In addition to the secured font resources, the printer has been internally modified to ensure high quality printing with MICR toner. Specific print densities, transfer voltages, and fusing temperatures are factory pre-set. The ST Secure MICR printer only supports Source Technologies MICR Toner cartridges.

MICR Fonts

The E-13B MICR font, designed specifically for the printer, is resident in Flash memory in your printer. Examples of the font characters are in the Appendix A of this manual. The font can only be activated after the appropriate PJL commands with the correct "PASSWORD" have been sent to the printer. The alternative MICR Font, CMC7, used in certain countries is also resident in Flash memory.

Secure Fonts

Two Source Technologies designed numeric secure fonts: Secure Numeric and ICR Secure Numeric, are resident and password protected in Flash memory in your printer. Examples of these fonts are in the Appendix B of this manual. Like the MICR font, these fonts can only be accessed after sending PJL commands with the correct "PASSWORD" from your application software.

The ICR Secure Numeric Font is designed for use in the Convenience Amount area of a check. This area contains the numeric dollar value and is located on the right side of the check approximately 2 inches up from the bottom edge. The imaging recognition features available in today's check reader/sorter equipment can optically read it. The Secure Numeric Font should not be used in this area of the check. It is a reverse image font and cannot be read automatically by the equipment.

We recommend you consider the use of both fonts as they are designed to deter check fraud.

© 2003, Source Technologies
All rights reserved

MicroPrint

Your ST Secure MICR Printer also has password protected and resident in Flash memory a MicroPrint font. We define microprinting as being equal to or less than 0.01" tall or equal to or less than 0.72 point size. When multiple characters are printed with the font, the resultant image appears to be a line on the page or document. Using low level magnification, the characters and words can be read to reveal overt or covert information. The font also contains the "MP" designate symbol that can be used at the end of a string or characters to identify its location. This would be an overt use of the font, in that its presence and location are clearly identified. The "MP" designate is printed with an exclamation point "!".

This font provides protection against reproduction by most scanners and digital copiers. We do not claim it is impossible to copy or reproduce, but it is difficult. Punctuation marks and spaces are ignored by this font and do not print.

Resource Storage

The Flash memory in the printer contains the five Source Technologies secured fonts, but the Flash memory can be loaded with additional resources for check or non-check printing. The Flash can be loaded with signature fonts, overlay Macros, or other custom resources up to the space available. Flash memory in the ST-9116 is read/write password protected. To load additional resources to Flash requires you to first issue the PJL commands to unlock the Flash memory device. We will review this in more detail in Section 7: MICR Commands.

Storing resources (fonts, Macros, etc.) in RAM is also an option. Resources in RAM are deleted when the printer is powered off. Resources in RAM cannot be password protected in the printer.

MICR Toner Cartridge

The ST Secure MICR printer only supports a Source Technologies MICR Toner Cartridge. The printer will display an error condition when a standard cartridge is installed. When a MICR Toner Cartridge is installed the following occurs:

1. Control image density or print density is set to optimum levels for MICR printing. Downloaded density commands and toner saver mode commands are ignored by the printer.

2. The printer forces internal copies to 1. Downloaded copy commands are ignored.

3. Automatic reprint of jammed documents is disabled, forcing the application to reprint any jammed documents. This provides an audit trail to the application of the jam event.

© 2003, Source Technologies
All rights reserved

7. MICR Commands

The following are the key PJL and PCL commands required to access MICR resources in the printer. For the complete source of information on PJL and PCL languages, consult the Lexmark Technical Reference documentation.

Fonts and Secured Resources

The ST Secure MICR printer has five fonts password protected in FLASH memory. The printer requires PJL commands with the correct password value to unlock the font resources, followed by PCL to print the fonts. They are then re-locked by PJL commands or by a printer power cycle.

The PJL commands to unlock the fonts must precede all PCL commands. The re-lock PJL commands must follow the PCL commands and final form feed command. The PCL commands could print an unlimited number of pages between the unlock and re-lock sequences. We will use <ESC> in the following examples to indicate the Escape character, ASCII 27. Values shown in parentheses () are hexadecimal.

PJL Unlock Sequence

```
<ESC>%-12345X@PJL LDECLARE LRESOURCE:"flash:" LRWLOCK="PASSWORD"(0D)(0A)
@PJL ENTER LANGUAGE=PCL(0A)
```

The sequence contains a UEL (Universal Exit Language) command followed by the unlock and enter language commands. The commands are case sensitive. PASSWORD is the initial ship default password value. The command delimiter is a Line Feed (hex 0A) with Carriage Return (hex 0D) being optional. Spaces are required as shown. The ENTER LANGUAGE command is optional but recommended. The command should also end with a LF (hex 0A). At this time all secured resources including any resources that are customer unique in FLASH are unlocked and available to PCL.

The password value is limited to no more than 8 alphanumeric case sensitive characters.

PJL Re-Lock Sequence

```
<ESC>%-12345X@PJL LDELETEPASSWORD LRESOURCE:flash:"(0D)(0A)
<ESC>%-12345X
```

Sent after PCL, this sequence re-locks the resources with no change in the password value. The PJL syntax of LDELETEPASSWORD is ***not*** the password. The command sequence terminates with the UEL command (Universal Exit Language). This is optional but recommended.

© 2003, Source Technologies
All rights reserved

PJL Re-Lock Sequence With A New Password Value

```
<ESC>%-12345X@PJL DEFAULT LRESOURCE:"flash:" LRWLOCK="xxxxxxxx"(0D)(0A)
<ESC>%-12345X
```

This command requires the resources to be previously unlocked. The new password is represented by the value xxxxxxxx. Th UEL is again optional but recommended.

After consulting Lexmark Technical Reference materials you may wish to expand the PJL sequences to include more than the examples above. To chain multiple PJL commands follow the following format:

```
(UEL)(PJL COMMAND)(0A)(PJL COMMAND)(0A)(PJL COMMAND)(0A)(UEL or ENTER
LANGUAGE)
```

The normal printer action to any format problems or missing or extra symbols is to ignore the PJL command. This does make troubleshooting format errors difficult. Have patience!

Note: Density and EconoMode PJL commands are ignored by the ST-9116.

PCL Font Call Commands

After PJL has unlocked the MICR FLASH resources, the ST-9116 uses standard PCL5e commands to print. The five resident Source Technologies MICR font resources are all bitmapped fonts and therefore cannot be scaled larger or smaller than the bitmapped images. These fonts can be called by either a PCL Font Selection String or by their ID. The commands are:

```
E13B MICR FONT   <ESC>(10O<ESC>(s0p8h8v0s7b360T     The Selection String
                 <ESC>(30802X                       The ID Call

SECURE NUMERIC   <ESC>(16C<ESC>(s0p5h36.24v0s112T   The Selection String
                 <ESC>(30043X                       The ID Call

ICR SECURE       <ESC>(1O<ESC>(s1p12v0s0b110T       The Selection String
                 <ESC>(30066X                       The ID Call

MICROPRINT       <ESC>(2Q<ESC>(s1p0.96v0s0b1023T    The Selection String
                 <ESC>(30055X                       The ID Call

CMC7 MICR FONT   <ESC>14Y<ESC>(s0p8h8v0s0b361T      The Selection String
                 <ESC>(30803X                        The ID Call
```


© 2003, Source Technologies
All rights reserved

MICR FONT NOTE – The E-13B and CMC7 Fonts are 8 characters per inch. To position correctly at an exact 8 characters per inch, the printer must be set to an internal Unit of Measure of 600 DPI or greater or must have a horizontal motion index command at 8 CPI be issued after the font call. This is true even if the base printer is at 600 DPI. The default character positioning is at 300 DPI and 8 into 300 is 37.5 pixels. The printer will either round down to 37 or up to 38 pixels causing characters to creep. To resolve this there are multiple options.

1. If you are using a printer driver that is set to 600 DPI, the printer data stream should include a Unit of Measure PCL command set to 600. The command is <ESC>&u600D

2. If the application controls the printer data stream, add the Unit of Measure command early in the data stream. The command also affects X & Y positioning commands. Add <ESC>&u600D

3. After calling the E-13B MICR font, issue a HMI (Horizontal Motion Index) command set to 8 characters per inch. The command must be included with every E-13B MICR font call using either the Selection String or ID call. The command string is:

```
<ESC>(10O<ESC>(s0p8h8v0s7b360T<ESC>&k15H font data The Selection String

<ESC>(30802X<ESC>&k15H font data                    The ID Call
```

See Font Mapping Appendix pages for specific character set data for each font.

PJL INFO MICR COMMAND

The ST Secure MICR Printer supports an optional custom bi-directional PJL Inquiry Command. The command provides printer information and cartridge information for network management. The command format is; @PJL INFO MICR

The command should be sent with UEL (Universal Exit Language) commands. Example:

```
<ESC>%-12345X        UEL
@PJL INFO MICR       INFO MICR Command
<ESC>%-12345X        UEL
```

The following data is returned

```
@PJL INFO MICR
PRINTER STATE = READY
              = BUSY
              = NOT READY
SERIAL NUMBER = XXXXXXXX
PAGECOUNT     = 123456
CARTRIDGE TYPE = NORMAL
               = MICR
```


© 2003, Source Technologies
All rights reserved

```
CARTRIDGE STATUS   = UNKNOWN
                   = OK
                   = LOW
                   = EMPTY
CARTRIDGE SERIAL# = XXXXXXXX
TONER LEVEL       = 0-9
                  = UNKNOWN
CARTRIDGE COUNT = XXXX
LOW THRESHOLD   = XXXX
EMPTY THRESHOLD = XXXX
```

- Printer State
  - "Ready" is the expected return
- Serial Number = Printer Serial Number
- Page Count = Printer Page Count
- Cartridge Type
  - "MICR" is the expected return. "Normal" could mean the command was sent to a non-MICR printer
- Cartridge Status
  - "OK, Low, and Empty" are the expected returns. "Unknown" is possible if the cartridge had just been installed.
- Cartridge Serial = Cartridge Serial Number
- Toner Level
  - A single digit return giving a rough estimate of toner remaining
  - 9 = Full, 0 = Empty
- Cartridge Count = xxxx
  - Data indicating toner usage by counting pixels printed
- Low Threshold = xxxx
  - The Toner Low point based on cartridge count value
- Empty Threshold = xxxx
  - A cartridge count value that determines when printing must stop to ensure quality MICR documents

© 2003, Source Technologies
All rights reserved

Error Messages

A majority of the printer error conditions are documented in the User's manual for the printer. The following are additional error conditions related to the ST Secure MICR printer.

Toner Low

The printer will stop with Error and Press Button lights on at the first indication of toner being low. Press the button and the printer will return to Ready and continue printing. The Toner Low light will be on steady. While in the toner low state, the printer will stop again on power cycles and other situations such as jams or paper out conditions. Simply press the button to continue printing. The low toner condition will continue until the cartridge is replaced or Toner Out is reached.

Toner Out

After approximately 250 pages beyond the first Toner Low condition the printer will stop printing and display a Toner Out condition. Both the Toner Low light and the Error light will blink. All other lights will be off. You must replace the cartridge to continue printing.

Ready / Data	**Off**
Toner Low	**Blinking**
Load Paper	**Off**
Paper Jam	**Off**
Error	**Blinking**
Press Button	**Off**

The 250 pages are based on a printing coverage percentage of 5% per page average. If actual printing uses less toner, the stop will occur after 250 pages. If the actual printing uses more toner the stop will occur short of 250 pages. Actual toner usage determines TONER OUT.

Load MICR Toner

The ST Secure only supports MICR toner cartridges. This prevents the printing of MICR documents with standard toner. A standard cartridge can be physically installed but the printer will not come to a Ready state. Instead the following light pattern will appear;

Ready / Data	**Off**
Low Toner	**Blinking**
Load Paper	**Off**
Paper Jam	**Off**
Error	**On**
Press Button	**Off**

© 2003, Source Technologies
All rights reserved

8. MICR Command Example

Figure 8.1, is an illustration of an Accounts Payable check and remittance information. The page used a PCL MACRO for the static data and background design. This manual does not address MACRO design and programming, but the variable text information including all the PJL and PCL commands used to print the example are on the page following the sample check. For illustrative purposes there are some extra spaces in the text preceding the printable data. The following paragraphs describe the command functions. The commands are a minimal set chosen to produce the example. Please consult Lexmark Technical publications for the complete descriptions of PJL and PCL printer commands

PJL Unlock Sequence

The first two lines of the variable text example are PJL commands that unlock the MICR font resources and enter PCL language processing. The password used is PASSWORD, the initial ship default. These commands and all following commands are all case sensitive.

<ESC> is used to illustrate the ASCII Escape Character, ASCII 27, hex 1B. An actual data stream requires the Escape Character, not <ESC>.

PCL Initial Set-Up

The next two commands set up some printer PCL variables. These commands are normally early in the data stream. We chose a minimal set. <ESC>&l2a1h6d1e64F sets the paper size to LETTER, the input tray to TRAY 1, the lines per inch to 6, the top margin to 1, and the lines per page to 64. The next command, <ESC>&u600D, is the Unit of Measure command set to 600 dots per inch mentioned in Section 7. This affects proper MICR line spacing and X and Y cursor positioning.

PCL MACRO Call

The next command calls MACRO 100 that was previously loaded in RAM memory. When called the graphic background, logos, and static data is written to the internal print buffer.

© 2003, Source Technologies
All rights reserved

PCL Font Calls, Positioning Commands and Variable Print Data

The next eleven lines of data in the example call printer resident fonts, position the cursor, and print the variable information. We are again using the minimal data required, particularly the font selection strings, <ESC>(s4099t0b10H being a very short version to call Courier, Normal Weight, 10 Pitch.

<ESC>*p300x600Y is a PCL positioning command. In this case its values are 600 pixels down and 300 pixels to the right of the upper left corner of the page. The Unit of Measure command determines the exact distance.

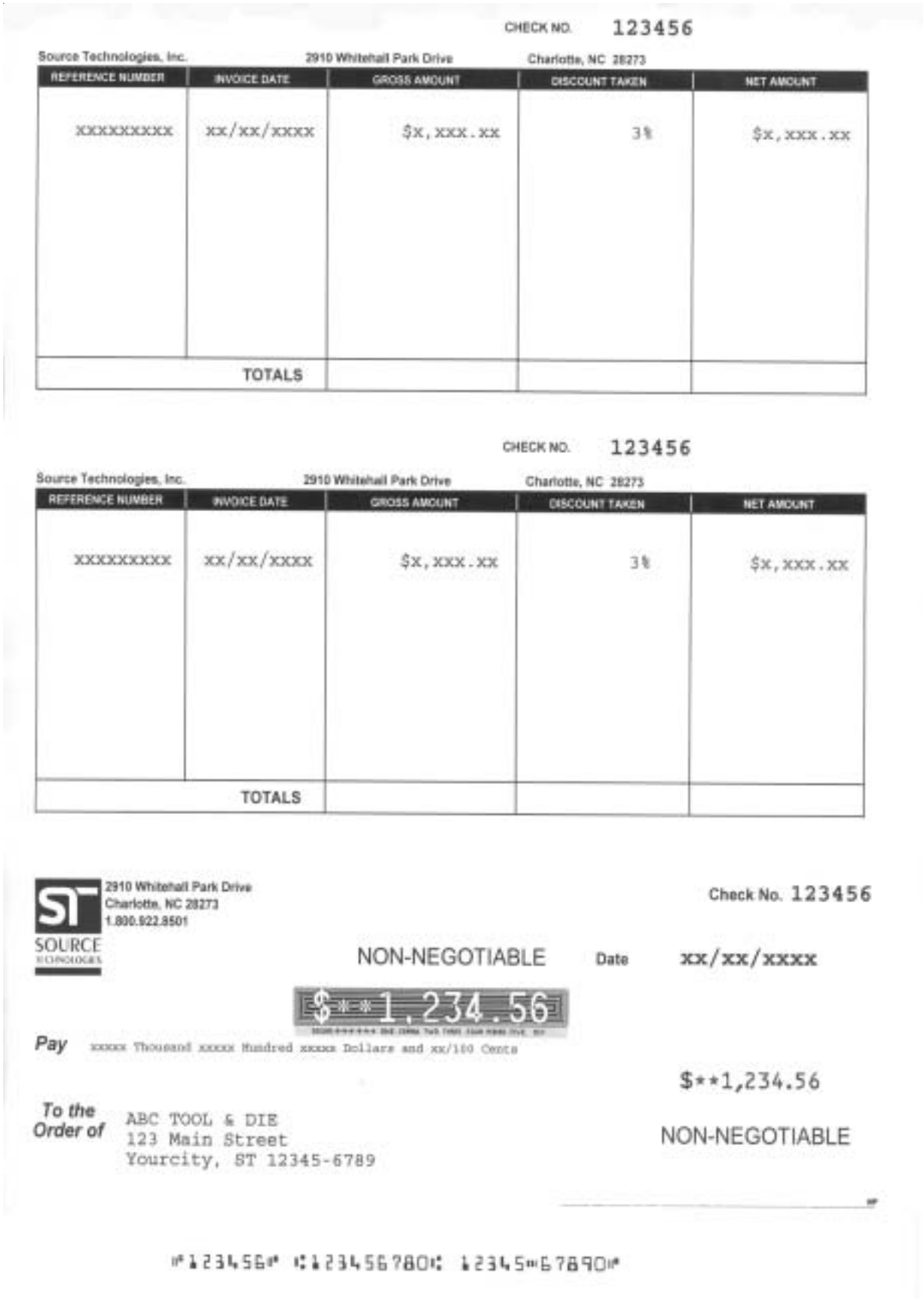
The next 4 lines call our secured MICR font resources. We are using the ID for the font call. The Form Feed prints the page.

PJL Re-Lock Sequence

The last two lines re-lock the secured fonts. The password is not changed in this example.

© 2003, Source Technologies
All rights reserved

FIGURE 8.1 SAMPLE ACCOUNTS PAYABLE CHECK



CHECK NO. 123456

Source Technologies, Inc. 2910 Whitehall Park Drive Charlotte, NC 28273

REFERENCE NUMBER	INVOICE DATE	GROSS AMOUNT	DISCOUNT TAKEN	NET AMOUNT
xxxxxxxxx	xx/xx/xxxx	$x,xxx.xx	3%	$x,xxx.xx
TOTALS				

CHECK NO. 123456

Source Technologies, Inc. 2910 Whitehall Park Drive Charlotte, NC 28273

REFERENCE NUMBER	INVOICE DATE	GROSS AMOUNT	DISCOUNT TAKEN	NET AMOUNT
xxxxxxxxx	xx/xx/xxxx	$x,xxx.xx	3%	$x,xxx.xx
TOTALS				

2910 Whitehall Park Drive
Charlotte, NC 28273
1.800.922.8501

SOURCE TECHNOLOGIES

Check No. 123456

NON-NEGOTIABLE Date xx/xx/xxxx

$**1,234.56

Pay xxxxx Thousand xxxxx Hundred xxxxx Dollars and xx/100 Cents

$**1,234.56

To the Order of ABC TOOL & DIE
123 Main Street
Yourcity, ST 12345-6789

NON-NEGOTIABLE

⑈123456⑈ ⑆123456780⑆ 12345=67890⑈

© 2003, Source Technologies
All rights reserved

PJL and PCL commands used to print the sample check:

<ESC>%-12345X@PJL LDECLARE LRESOURCE:"flash:" LRWLOCK="PASSWORD"

@PJL ENTER LANGUAGE = PCL

<ESC>&l2a1h6d1e64F

<ESC>&u600D

<ESC>&f100y3X

<ESC>(s4099t0b10H

<ESC>*p300x600Y xxxxxxxxx xx/xx/xxxx $x,xxx.xx 3% $x,xxx.xx

<ESC>*p300x2775Y xxxxxxxxx xx/xx/xxxx $x,xxx.xx 3% $x,xxx.xx

<ESC>*p3250x75Y<ESC>(s4099t3b8H 123456

<ESC>*p3250x2200Y 123456

<ESC>*p4250x4450Y 123456

<ESC>*p3650x4775Y xx/xx/xxxx

<ESC>*p400x5225Y<ESC>(s4099t0b15H xxxxx Thousand xxxxx Hundred xxxxx Dollars and xx/100 Cents

<ESC>*p600x5600Y<ESC>(s10H ABC TOOL & DIE

<ESC>*p600x5700Y 123 Main Street

<ESC>*p600x5800Y Yourcity, ST 12345-6789

<ESC>*p900x6325Y<ESC>(30802X<ESC>&k15H O123456O T123456780T 12345D67890O

<ESC>*p1500x5100Y<ESC>(30043X ($**1,234.56)

<ESC>*p3650x5400Y<ESC>(30066X $**1,234.56

<ESC>*p3000x6000Y<ESC>(30055X PAY ABC TOOL & DIE x THOUSAND XXX HUNDRED AND XX CENTS PAY etc.

<0C> Form Feed

<ESC>%-12345X@PJL LDELETEPASSWORD LRESOURCE:"flash:"

<ESC>%-12345X

© 2003, Source Technologies
All rights reserved

Appendix A: E13B MICR Font Mapping

MICR Font Character	Description	Alpha/Numeric Values[1]	Hex Values
	Amount Symbol	A a /	41 61 2F
	Transit Symbol	T t B b :	54 74 42 62 3A
	On-Us Symbol	O o C c ;	4F 6F 43 63 3B
	Dash Symbol	V v D d - =	56 76 44 64 2D 3D
	Zero	0	30
	One	1	31
	Two	2	32
	Three	3	33
	Four	4	34
	Five	5	35
	Six	6	36
	Seven	7	37
	Eight	8	38
	Nine	9	39

Example:

[1]Select only one alphanumeric character to call the font.

© 2003, Source Technologies
All rights reserved

Appendix B: Secure Numeric Font Mapping

Description	Alpha/Numeric Character	Hex Value	Secure Font Character
Dollar Sign	$	23	
Left Bracket	(	28	
Right Bracket	)	29	
Asterisk	*	2A	
Comma	,	2C	
Dash	-	2D	
Period	.	2E	
Slash	/	2F	
Zero	0	30	
One	1	31	
Two	2	32	

© 2003, Source Technologies
All rights reserved

Appendix B continued: Secure Numeric Font Mapping

Description	Alpha/Numeric Character	Hex Value	Secure Font Character
Three	3	33	
Four	4	34	
Five	5	35	
Six	6	36	
Seven	7	37	
Eight	8	38	
Nine	9	39	
Arrow	>	3E	

Example:

NOTE: The secure fonts in the example are magnified for purposes of clarity.

© 2003, Source Technologies
All rights reserved

Appendix C: ICR Secure Numeric Font Mapping

Description	Alpha/Numeric Character	Hex Value	Character
Zero	0	30	
One	1	31	
Two	2	32	
Three	3	33	
Four	4	34	
Five	5	35	
Six	6	36	
Seven	7	37	
Eight	8	38	
Nine	9	39	
Asterisk	*	2A	
Comma	,	2C	
Period	.	2E	
Dollar Sign	$	23	

NOTE: The secure fonts in the example are magnified for purposes of clarity.

© 2003, Source Technologies
All rights reserved

Appendix D: CMC7 MICR Font Mapping

Description	Alpha/Numeric Characters	Hex Values	CMC7 Font Values[1]
Zero	0	30	
One	1	31	
Two	2	32	
Three	3	33	
Four	4	34	
Five	5	35	
Six	6	36	
Seven	7	37	
Eight	8	38	
Nine	9	39	
Colon	:	3A	
Semi-Colon	;	3B	
Less Than	<	3C	
Equal	=	3D	
Greater Than	>	3E	

[1]The CMC7 Font in the example above is magnified for purposes of clarity.

© 2003, Source Technologies
All rights reserved